

**PAINT AND SPRAY SYSTEMS
(NFPA 33)
PLAN CORRECTION LIST**

Plans have been reviewed for compliance with the 1999 Standard Building Code, 1997 Standard Mechanical Code, 2003 National Fire Codes, NFPA 33 Standard for Spray Application Using Flammable or Combustible Material and the 2002 North Carolina Handicapped Code with 2004 revisions). The following list does not necessarily include all deficiencies and is focused on adding a paint and spray booth inside an existing structure. Refer to a separate correction list for specific occupancy and building system for new construction and/or renovation. See additional items on the cover sheet.

PLEASE NOTE: Circled items require correction by revised plans, addenda, field orders, or change orders before plans can be approved for construction. Answers in letterform are not acceptable. **Starting construction before plans approval may be considered as just cause, by the State, to issue a stop work order. [C&I RULE 0780-2-3-.02(4)] All plans must be sufficiently detailed to enable the reviewer to determine accurately whether the proposed construction would be in compliance with applicable standards of fire prevention, fire protection, and building construction safety. [C&I RULE 0780-2-3-.03(b)]**

i SELECTED NFPA 33 DEFINITIONS

1. **Approved.** Acceptable to the authority having jurisdiction.
2. **Authority Having Jurisdiction (AHJ).** An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.
3. **Listed.** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.
4. **Spray Area.** Any area in which dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes. It can be either enclosed or unenclosed and includes: (a) any area in the direct path of a spray application process; (b) the interior of any exhaust plenum and any exhaust duct leading from the spray process; (c) the interior of any limited finishing workstation, spray booth, or spray room, as herein defined; (d) the interior of any air recirculation particulate filter, solvent concentrator unit, solvent distillation (recovery) unit, or recirculation air supply unit.
5. **Combustible Liquid.** Any liquid that has a closed-cup flash point at or above 37.8°C (100°F), as determined by the test procedures and apparatus set forth in 1.7.4. Combustible liquids are classified as Class II or Class III as follows: Class II Liquid — any liquid that has a flash point at or above 37.8°C (100°F) and below 60°C (140°F); Class IIIA — any liquid that has a flash point at or above 60°C (140°F), but below 93°C (200°F); Class IIIB — any liquid that has a flash point at or above 93°C (200°F). [30:1.7]
6. **Flammable Liquid.** Any liquid that has a closed-cup flash point below 37.8°C (100°F), as determined by the test procedures and apparatus set forth in 1.7.4. Flammable liquids shall be classified as Class I as follows: Class I Liquid — any liquid that has a closed-cup flash point below 37.8°C (100°F) and a Reid vapor pressure not exceeding 2.7 bar (40 psia) at 37.8°C (100°F), as determined by ASTM D 323, Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method). Class I liquids shall be further classified as follows: (1) Class IA liquids — those liquids that have flash points below 22.8°C (73°F) and boiling points below 37.8°C (100°F); (2) Class IB liquids — those liquids that have flash points below 22.8°C (73°F) and boiling points at or above 37.8°C (100°F); (3) Class IC liquids — those liquids that have flash points at or above 22.8°C (73°F), but below 37.8°C (100°F). [30:1.7]

ii **NFPA 33 LOCATION CLASSIFICATIONS**

1. **Class I Locations.** A Class I location shall be any location where a flammable gas or vapor is present or might be present in the air in quantities sufficient to produce an explosive or ignitable mixture.
2. **Class I, Division 1 Locations.** A Class I, Division 1 location shall be any location where one of the following conditions exist:
 - (1) Where an ignitable concentration of flammable gas or vapor can exist under normal operating conditions.
 - (2) Where an ignitable concentration of flammable gas or vapor can exist frequently because of repair or maintenance operations or because of leakage.
 - (3) Where breakdown or faulty operation of equipment or processes might release an ignitable concentration of flammable gas or vapor and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.
3. **Class I, Division 2 Locations.** A Class I, Division 2 location shall be any location where one of the following conditions exist:
 - (1) Where a flammable gas or a volatile flammable liquid is handled, processed, or used, but any flammable gas, vapor, or liquid is confined within a closed container or a closed system from which it can escape only in case of accidental rupture or breakdown of the container or system or in case of abnormal operation of the equipment.
 - (2) Where an ignitable concentration of flammable gas or vapor is normally prevented by positive mechanical ventilation, but which might exist because of failure or abnormal operation of the ventilating equipment.
 - (3) Where an ignitable concentration of flammable gas or vapor might occasionally be transmitted from an adjacent Class I, Division 1 location, unless such transmission is prevented by positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.
4. **Class I, Zone 0 Locations.** A Class I, Zone 0 location shall be any location where an ignitable concentration of flammable gas or vapor is present either continuously or for long periods of time.
5. **Class I, Zone 1 Locations.** A Class I, Zone 1 location shall be any location where one of the following conditions exist:
 - (1) Where an ignitable concentration of flammable gas or vapor is likely to exist under normal operating conditions.
 - (2) Where an ignitable concentration of flammable gas or vapor can exist frequently because of repair or maintenance operations or because of leakage.
 - (3) Where breakdown or faulty operation of equipment or processes might release an ignitable concentration of flammable gas or vapor and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.
 - (4) Where an ignitable concentration of flammable gas or vapor might occasionally be transmitted from an adjacent Class I, Zone 0 location, unless such transmission is prevented by positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.
6. **Class I, Zone 2 Locations.** A Class I, Zone 2 location shall be any location where one of the following conditions exist:
 - (1) Where an ignitable concentration of a flammable gas or vapor is not likely to exist under normal operating conditions and, if an ignitable concentration does exist, will exist only for a short period of time.
 - (2) Where a flammable gas or a volatile flammable liquid is handled, processed, or used, but any flammable gas, vapor, or liquid is confined within a closed container or a closed system from which

it can escape only in case of accidental rupture or breakdown of the container or system or in case of abnormal operation of the equipment.

- (3) Where an ignitable concentration of flammable gas or vapor is normally prevented by positive mechanical ventilation, but which might exist because of failure or abnormal operation of the ventilating equipment.
 - (4) Where an ignitable concentration of flammable gas or vapor might occasionally be transmitted from an adjacent Class I, Zone 1 location, unless such transmission is prevented by positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.
7. **Class II Locations.** A Class II location shall be any location that might be hazardous because of the presence of a combustible dust.
8. **Class II, Division 1 Locations.** A Class II, Division 1 location shall be any location where one of the following conditions exist:
- (1) Where combustible dust is in the air in quantities sufficient to produce explosive or ignitable mixtures under normal operating conditions.
 - (2) Where mechanical failure or abnormal operation of machinery or equipment might cause an explosive or ignitable mixture of combustible dust in air and might also provide a source of ignition through simultaneous failure of electrical equipment, operation of protection devices, or from other causes.
 - (3) Where combustible dust of an electrically conductive nature might be present in hazardous quantities.
9. **Class II, Division 2 Locations.** A Class II, Division 2 location shall be any location where one of the following conditions exist:
- (1) Where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitable mixtures and accumulations of dust are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust might be in suspension in air as a result of infrequent malfunctioning of handling or processing equipment.
 - (2) Where accumulations of combustible dust on, in, or in the vicinity of the electrical equipment might be sufficient to interfere with the safe dissipation of heat from electrical equipment or might be ignited by abnormal operation or failure of the electrical equipment.

I. PROCEDURES

- *1. Provide two copies of plans and one copy of specifications sealed (with signature and date) by a registrant in accordance with the Architects and Engineers Licensing Law Rules. [Rule 0780-2-3-.03 and A&E Rule 0120-2-.08(3)]
- *2. Provide a second set of final plans and revisions for the job site set. [Rule 0780]
- 3. Provide on the required cover sheet of the plans for new and existing buildings the following information:
 - (1) Building Construction:
 - i. SBC 1999 construction type
 - ii. (un) protected
 - iii. (un) sprinkled
 - iv. number of stories and height of building
 - v. area of building per SBC Table 500 (identify new and existing). Show any area increase calculations per SBC 503.3.
 - (2) Occupancy type per 2003 NFPA 101

- (3) Occupant load of all by building and area (may be by table).
 - (4) Referenced codes with edition dates.
 - (5) Identify if the spray booth/room/area involves the application of flammable or combustible materials either continuously or intermittently by any of the following atomization means [NFPA 33 1.1.1].
 - i. Compressed air atomization
 - ii. Airless or hydraulic atomization
 - iii. Electrostatic Application methods
 - iv. Other atomization means of application
 - (6) Identify if the spray booth/room/area involves the application of flammable or combustible materials either continuously or intermittently by any of the following fluidized means [NFPA 33 1.1.2].
 - i. Fluidized bed application methods
 - ii. Electrostatic fluidized bed application methods
 - iii. Other means of fluidized application methods
 - (7) Identify if the spray booth/room/area involves the application of water borne, water based, or water reducible materials that contain flammable or combustible liquids or that produce combustible deposits or residues [NFPA 33 1.1.3]
 - (8) Design Intent's approach to comply with NFPA 33 as described in section II GENERAL, item 4. Indicate by (1), (2) or (3) or describe in designer's own words equivalent to Section II, 4(1), (2) or (3).
 - (9) Identify what drying/fusing action the spray booth/room/area involves; be specific such as ambient or heated air. [NFPA 33 13.1]
- *4. Provide a Life Safety Plan showing: Occupant load with occupant load factors for each space based on its intended use; main exit access path with egress capacity; egress width provided to ensure minimum egress capacity; accessible means of egress to a public way identifying location of any area of refuge, required exterior exit doors, exit stair landing, and any elevator for unsprinkled buildings or for sprinkler buildings show the access to the public way from each minimum required number of exits from the building. Show all fire rated wall limits for occupancy separations, building compartmentalization walls, exit access corridors, stair exits, shafts, and separations from hazards.
- *5. Complete the plans review submittal form and remit the required fee. [Rule 0780-2-3]
6. The fee has been calculated incorrectly. Balance due is _____. We are refunding _____. The refund process takes approximately 6 to 8 weeks.
 7. Not all required information on the plans review submittal form is incorrect and/or complete; correct and resubmit.
 8. For existing buildings and structures, cited code deficiencies in the inspection report (dated/requested) _____ must be addressed.
 9. The scope of work involves adding or modifying an NFPA 13 sprinkler system. See attached specialized correction lists. **NOTE: Sprinkler Shop Drawings will not be considered on any set if received prior to issuance of state approval of the Design Intent.**
- *10. Prior to any approval being granted, items with an asterisk (*) must be resolved.

NOTE: In order to expedite processing of this project please refer to “TFM NUMBER” on transmittal letter when submitting any correspondence, plans, specifications, etc.

II. GENERAL

- *1. Identify the mixing room, spray area, spray room and/or booth.
2. Provide interior finish for the spray area or room.
3. Show wall ratings on structural, mechanical, plumbing, electrical, and fire protection drawings.
- *4. Provide one of the following and indicate on the cove the design intent to comply (see also section VII MECHANICAL):
 - (1) UL or ETL listing card for the listed booth directly in the prints. This is needed for NFPA 33 pre-compliance verification. **NOTE: for any listing to be accepted, the pre-engineered spray booth must have been listed using the currently adopted version of NFPA 33 and associated codes and standards.** Provide additional information that established these editions.
 - (2) For non-listed booths, send two copies of all booth manufactured drawings structural drawings, stamped by the responsible Mechanical Engineer, registered in the State of Tennessee. Show all assembly details, fastening schedules and sub-assembly lists complete with their UL or ETL listing cards directly in prints.
 - (3) For existing installations only, provide current (issued within the last 6 months) certification UL (ETL Services not recognized at this time) evaluated against the currently adopted edition of NFPA 33 and associated codes and standards for this specific site issued by an authorized Field Services Engineer of Underwriters Laboratories which includes evaluation of the fire suppression system, exhaust and makeup air systems. Air volume calculations and other details will be required.
5. **FIRE STOPPING SYSTEMS:** Specify test number, hourly rating, and provide detail(s) in their entirety which include application instructions, material specifications and design illustrations without modification or manipulation directly on plans of current U.L. (or other approved third party nationally recognized testing laboratory) tested systems for each size and type of penetrating object such as metallic and nonmetallic electrical, plumbing, HVAC piping and ductwork, fire protection piping, electrical wiring, or conduit through fire resistive assemblies SBC 705.4 and NFPA 101 8.3.5. The details must be provided directly in the plan set and not in Architectural Supplemental Instruction (ASI), addenda, or within the specifications or project manual. Provide plumbing details for toilet, shower, and tub penetrations at 1-hour fire rated floor assemblies and plumbing penetrations within walls when penetrating 1-hour rated floor assemblies. UL permits the free duplication and inclusion for design professionals in their designs (see “Important Information For Users Of This Directory, Use of This Directory” in Volume 1 of the 2004 printed Fire Resistance Directory - or - at the bottom of each “record” (i.e. UL system number) on the online certification directory available <http://www.ul.com> for UL’s terms and conditions of use).
13. **WALLS, CEILINGS, FLOOR/CEILING AND ROOF ASSEMBLIES:** Show what UL or other assembly number is being used for the fire-rated roof/ceiling, floor/ceiling, and wall assemblies. [SBC 701.2] Specify that all component parts comply with tested assemblies. Provide detail(s) in their entirety which include design illustrations and material specifications without modification or manipulation directly on plans of current U.L. (or other approved third party nationally recognized testing laboratory) tested assembly. The details must be provided directly in the plan set and not in Architectural Supplemental Instruction (ASI), addenda, or within the specifications or project manual. UL permits the free duplication and inclusion for design professionals in their designs (see “Important Information For Users Of This Directory, Use of This Directory” in Volume 1 of the 2004 printed Fire Resistance Directory - or - at the bottom of each “record” (i.e. UL system number) on the online certification directory available <http://www.ul.com> for UL’s terms and conditions of use).

14. JOINT SYSTEMS: Provide design number, hourly rating, and detail(s) in their entirety which include design illustrations, material specifications without modification or manipulation directly on plans of current U.L. (or other approved third party nationally recognized testing laboratory) tested assembly for fire rated assembly connections such as (wall-to-wall, floor-to-floor, floor-to-wall, head-of-wall, bottom-of-wall, joints) where not inherently tight. The details must be provided directly in the plan set and not in Architectural Supplemental Instruction (ASI), addenda, or within the specifications or project manual. UL permits the free duplication and inclusion for design professionals in their designs (see "Important Information For Users Of This Directory, Use of This Directory" in Volume 1 of the 2004 printed Fire Resistance Directory - or - at the bottom of each "record" (i.e. UL system number) on the online certification directory available <http://www.ul.com> for UL's terms and conditions of use).
15. Identify type and quantity of chemicals for each room to determine classification of hazard of contents. [SBC 308.2 and NFPA 101 4.2.2]
- *16. Provide material safety/hazardous data sheet (MSDS) of each flammable or hazardous product used in the paint area, spray area, storage room, and mixing room.
17. Visible hazard identification signs as specified in NFPA 704 must be placed at all entrances. [SBC 407.2.10]
18. Provide a reflected ceiling plan showing lights, diffusers, sprinkler head, smoke detector, etc. within the applicable areas and rooms.
19. Spray application must be contained to spray booth, spray room and/or spray area [NFPA 33 4.1].
- *20. A specialized and separate mixing room is required. The spray booth/area is not acceptable as substitute for mixing or storage facilities. [NFPA 33 8.3.1 and 8.3.2]
21. Spray application operation and processes shall not be conducted in any building that is classified as an assembly, educational, institutional, or residential occupancy unless they are located in a room that is fully separated by 2 hour fire resistive rating assemblies both horizontally and vertically and is protected by an NFPA 13 sprinkler system [NFPA 33 4.2].

III. SITE

- *1. The scope of work has elements of site design covered by an occupancy based correction list.

IV. PAINT AREA/MIXING ROOM CONSTRUCTION

- *1. The existing building exceeds allowable area/number of stories/height for this type of construction and open space. [SBC Table 500] The proposed scope of work will not be permitted until additional modifications in the height and area are effected such that compliance to Table 500 is achieved.
2. Show what UL or other assembly number is being used for the roof/ceiling, floor/ceiling, and wall assemblies for the paint area and/or mixing room. [SBC 705.4] Specify that all component parts comply with tested assemblies.
3. Every high hazard industrial areas must be fully sprinkled or provided with other acceptable extinguishing or protection systems. [NFPA 101 28.3.2 and SBC Table 500 and 407.1.3]

4. Every high hazard industrial explosion venting or suppression systems must be provided in accordance with SBC 407.2.2 and NFPA 68 and 69.
5. Every high hazard industrial control areas containing hazardous material not exceeding the exempt quantities are permitted in all occupancies except assembly occupancies. The maximum number of control areas per floor in multi-story buildings is limited to four. The maximum number of control areas in any building is limited to ten. [SBC 308.2.2]
6. Control areas shall be separated by one-hour fire resistant construction when located on the same floor. If located on different floors but adjacent to each other, the floor/ceiling between these control areas must have not less than two-hour fire resistant construction. [SBC 308.2.2 and Table 700]
7. When the floor/ceiling assembly forms part of the separation, the separation must extend from floor to deck. [SBC 308.2.2]
8.
 - (1) Exterior and interior walls must be fireblocked at each floor, ceiling, and roof with an approved noncombustible material tested for this purpose. [SBC 705.3]
 - (2) Expansion and seismic joints in rated walls and floors must be protected per NFPA 101 6.2.4.2.
9. Provide spill control in every high hazard area, drainage, and containment requirements see SBC 407.2.3.
10. Fire rated walls must extend tight against the underside of a roof or floor deck or to the underside of a rated smoke tight ceiling which has the same rating as the wall (e.g., two layers of 5/8 inch rated gypsum panels at the ceiling for tenant separation, one hour storage or janitor spaces, and one or two hour rated walls turned horizontally and anchored to the walls for corridors, elevator, stair, and breezeway ceilings). [NFPA 101 8.2.2.3] Provide details.
11. Glazing in fire rated doors must be wired glass or other tested glazing material, and must be limited in size according to door rating. [SBC 705.1.3.6]
12. Specify that fire rated doors must have fire rated frames, hardware, closers, and other rated accessories. [1999 NFPA 80 1-4 Definition of "Fire Door," NFPA 80 1-6.1, 2-4.7, and SBC 705.1.3]
13. Closers and positive latching are required on fire rated doors and doors in smoke tight partitions or barriers. [NFPA 101 7.2.1.8, 1999 NFPA 80 3-4, and SBC 705.1.3.5]
13. Walls and ceilings that intersect or enclose a spray area shall be constructed of noncombustible or limited-combustible materials and assemblies and shall be securely and rigidity mounted or fastened. [NFPA 33 5.1]
14. The interior surface of the spray area, room or booth shall be smooth and designed and installed to prevent pockets that can trap residues, and designed facilitate ventilation and cleaning. [NFPA 33 5.1]
15. For spray areas and non-listed booths, air intake filters that are part of a wall or ceiling assembly shall be listed Class 1 or Class 2, in accordance with UL 900, *Test Performance of Air Filters*. [NFPA 33 5.1]
16. The floor of the spray room, area or booth must be constructed of non-combustible, limited-combustible material, or combustible material that is completely covered by non-combustible material. [NFPA 33 5.1]
17. For spray areas and non-listed booths, vision panels must be made from heat treated, wire-glass, or hammer wire-glass and must be sealed to confine vapors, residues, etc. to the spray area. Panels for

externally mounted light fixtures must be separated from the fixtures such that the surface temperature of the glass does not exceed 200°F. [NFPA 33 5.5]

18. Aluminum must not be used for structural support members or the walls or ceiling of a spray booth. [NFPA 33 5.1.3]
19. Aluminum shall not be used for any part of the ventilation ductwork associated with the spray booth or spray room. [NFPA 33 3.1.3]
20. Aluminum shall not be used for any interior components such as platform; spray apparatus support components, and other ancillary devices. [NFPA 33 5.1]
21. For non-listed booths single-skin walls or ceiling assemblies cannot be used unless they are at least 0.0478 inch thick and each double-skin assembly shall be no thinner than 0.0359 inch thick. [NFPA 33 5.1.4]
- *22. Spray rooms shall be constructed of and separated from surrounding buildings by construction assemblies that have a fire resistance rating of 1 hour. [NFPA 33 5.1.6]
23. Spray booths shall be separated from other operations by a minimum distance of 3 feet or by a partition, wall or floor/ceiling assembly having a minimum fire resistance rating of 1 hour. Multiple spray booths connected together shall be considered as a single operation. [NFPA 33 5.3]
24. Whether listed or not, spray booths shall be installed so that all parts of the spray booth are readily accessible for cleaning. [NFPA 33 5.3.1]
25. Clear space about the spray booth must not be less than 3 feet in all directions unless exceptions are met. [NFPA 33 5.3.2]

V. MEANS OF EGRESS

- *1. The scope of work has elements of provisions for means of egress design covered by an occupancy based correction list.

VI. INTERIOR

- *1. The scope of work has interior finish requirements covered by an occupancy based correction list.

VII. MECHANICAL

- *1. The scope of work has mechanical design requirements covered by an occupancy based correction list.
- *2. The paint booth must be listed by a nationally recognized testing laboratory (U.L., ETL, etc.) to the state adopted edition of NFPA 33 and associated standards or engineered by a Tennessee Registered Professional Engineer competent in the area of hazardous materials storage, the spray application of flammable and combustible materials, fire alarms, electrical motor controls/safety interlocks and fire suppression in accordance with the state adopted editions of NFPA 30, NFPA 33, NEC/NFPA 70, NFPA 72, NFPA 101, NFPA 91, and applicable fire suppression standard (i.e. NFPA 12, 13, 16, 17 and/or 2001). The booth system must be installed as it is listed. Provide the following listing information: on-line U.L. listing card/file and identify specific criteria for the system: model number, booth length and width, minimum exhaust CFM, maximum supply CFM, and any application restrictions. [TCA 62-2-102, TCA 68-120-101, Rule 0780-2-2, Rule 0780-2-3, NFPA 33, Office Policy, and terms of third party listing]

- *3. Provide the manufacturer's specification sheet directly in plans without modification of any kind for the exhaust fan. The unit must be installed and employed in agreement with its listing. Provide the following listing information: on-line U.L. listing card/file and identify specific criteria for the system: model number, special features such as tethered/tilt, non-ferrous blades, TEFC motor, explosion proof, etc., fan curves, electrical data, connection and mounting details, etc. [33 7.10.1, Office Policy and terms of third party listing]
- *4. Provide the manufacturer's specification sheet directly in plans without modification of any kind for the supply air unit. The unit must be installed and employed in agreement with its listing and be suitably interlocked per NFPA 33. Provide the following listing information: on-line U.L. listing card/file and identify specific criteria for the system: model number, special features such as heated/non-heated, approved for elevated temperatures/drying, TEFC motor, explosion proof, fuel gas/electric heat, etc., fan curves, electrical data, connection and mounting details, etc. [NFPA 86, NFPA 33 13.1, NFPA 33 13.1.2, Office Policy and terms of third party listing]
5. Mechanical ventilation shall be kept in operation during all hours of spray systems operation. The spray system must be interlocked to the spray application equipment if the operation is not constantly monitored by an attendant. [NFPA 33 7.2.3] Provide all of the following:
- (1) Complete electrical details inclusive of factory and field based terminations.
 - (2) Terminal designations, device descriptions and locations, wiring material and gauges.
 - (3) Details on any safety switch and location of protective bollards.
 - (4) Listed means of interlock (i.e. shunt trip, solenoid, mechanical switch, etc.)
 - (5) Wiring diagram
6. Makeup air must be provided to balance the exhausted air and located such there is no recirculation of contaminated air unless specifically designed to do so. [NFPA 33 7.3 and NFPA 33 7.5.1] Provide all of the following:
- (1) Balancing schedule
 - (2) Table of calculated friction losses for supply and exhaust at the expected design point (include booth and/or filter losses).
 - (3) Fan curves (exhaust and make up air)
 - (4) Manufacturer and model number
 - (5) _____ .
7. Overspray collection filters must have visible gauges, audible alarms, or an effective inspection program. Provide either 1) details or 2) a inspection schedule form on owner's letterhead. [NFPA 33 7.2.1]
8. Exhaust ducts from spray operations must be routed to the outside in the most direct manner available and extend to at least 6 feet above any exterior wall or roof. [NFPA 33 7.4]
9. Exhaust ducts from spray operations must not penetrate a fire wall. [NFPA 33 7.4]
10. Exhaust ducts from spray operations must not discharge towards any combustible construction within 25 feet of the duct's outlet nor discharge toward any unprotected opening in any noncombustible or limited-combustible construction that is within 25 feet of the exhaust discharge point. [NFPA 33 7.4]
11. Exhaust ducts from spray operations must not be manifolded together unless exceptions are met. [NFPA 33 7.6]
12. Exhaust ducts, materials and fasteners must be of steel unless steel is specifically incompatible with the spray operation. [NFPA 33 7.7]

13. Exhaust ducts must be designed to support the weight of the duct itself and any anticipated residual material buildup inside. Exhaust ducts must also support the anticipated weight of any accumulated sprinkler discharge when sprinkler protection is provided inside of the ducts. [NFPA 33 7.8.1]
14. Exhaust ducts must not collapse under fire conditions. [NFPA 33.7.8]
15. Exhaust ducts must be complete themselves and not use other building components such as walls and ceilings to complete the duct enclosure. [NFPA 33 7.8.4]
16. Exhaust ducts from spray operations shall be permitted to be round, rectangular or any other suitable shape and must be provided with doors, panels and other means to facilitate inspection cleaning and maintenance and to access fire protection devices. [NFPA 33 7.9]
17. Air-makeup and spray area exhaust must not be interlocked with the fire alarm system and shall remain functional during any fire alarm condition unless one of the two specific exceptions apply. [NFPA 33 9.3]
18. The exhaust fan and drive used in spray operations must:
 - (6) Have a nonferrous fan blade or impeller or mechanically designed such that two separate ferrous components cannot strike one another. [33 7.10.1]
 - (7) The fan or blower assembly must be designed such that there is enough clearance between moving parts such that thermal expansion, vibration to prevent contact between moving parts or fire by friction. [33 7.10.1]
 - (8) The fan blade shaft must be strong enough to maintain alignment even when the blades are heavily overloaded. [33 7.10.1]
 - (9) All bearings are to be self-lubricating or can be lubricated from outside of the duct and/or booth. [33 7.10.1]

VIII. FIRE SUPPRESSION

1. Every hazardous (H-1, H-2, H-3, and H-4) factory industrial area must be sprinkled. [SBC Table 500]
2. Provide general layout of sprinkler system and show main risers, related electrical connections, available water supply and design water demand. [NFPA 13]
3. Provide standpipes located so that any interior point is within 100 feet of hose and within 30 feet of stream. [NFPA 14 3.2]
4. Provide a fire pump schematic with all-component parts and alarms per NFPA 20.
5. Laboratory fume hoods and spray booths where flammables are used shall be sprinkled. [SBC 407.1.3]
6. Vehicle loading docks and exterior storage must be sprinkled. [SBC 407.1.3.6]
- *7. Spray areas/rooms/booth which include associated plenums and ductwork, as well as particulate filters, solvent concentrator units, recirculation units, and mixing room and must be protected by an automatic fire suppression system. [NFPA 33 3.3.1.3 and 33 9.1]
8. Fire suppression system must meet one of the following:
 - (1) Automatic sprinkler systems must meet NFPA 13 which is designed for NFPA 13 "extra hazard" and must be installed by a licensed sprinkler contractor. [NFPA 33 9.1.1(1), 33 9.4.2 and Rule 0780-2-7]
 - (2) An automatic foam water sprinkler system that meets all applicable requirements of NFPA 16. [NFPA 33 9.1.1(2)]

- (3) A carbon dioxide extinguishing system that meets all applicable requirements of NFPA 12. [NFPA 33 9.1.1(3)]
 - (4) A dry chemical extinguishing system that meets all applicable requirements of NFPA 17. [NFPA 33 9.1.1(4)]
 - (5) A gaseous agent extinguishing system that meets all applicable requirements of NFPA 2001. [NFPA 33 9.1.1(5)]
9. The automatic sprinkler system must be a wet pipe system, a dry pipe system, a preaction system, or an open head deluge whichever is more appropriate for the operation to be protected, subject to the authority having jurisdiction. [NFPA 33 9.4.1]
10. For continuous spray application operations, one or more manual emergency system shutdown stations shall be installed to serve each spray area. When activated, the stations shall accomplish at least the functions listed in NFPA 33 9.2.1. At least one such station shall be within ready access of operating personnel. If access to this station is likely to involve exposure to danger, an additional station shall be located adjacent to an exit from the area. [NFPA 33 9.2.2]
11. Supply details of how the fire suppression piping is installed and maintains effective sealing/isolation of high/low pressure zones (i.e. the booth or spray area). Also these details must be effective in how they establish other elements of design such as the build up of flammable or combustible dusts, overspray, etc. Piping may be run inside or outside of the containment zone. [NFPA 33 3.3.10, NFPA 33 9.4.7, NFPA 33 10.2, NFPA A1.1, Rule 0780-2-3-.03(1)(b) and office policy]
12. The sprinklers for each spray area and mixing rooms shall be controlled by a separate, accessible, listed indicating valve. The sprinkler system in the stacks and ducts must be automatic and not subject to freezing. [NFPA 33 9.4.5]
13. Sprinklers protecting spray areas and mixing rooms shall be protected against overspray residue so that they will operate quickly in event of fire. [NFPA 33 9.4.7]
14. Sprinklers shall be permitted to be covered by cellophane bags having a thickness of 0.08 mm (0.003 in.) or less or by thin paper bags. These coverings shall be replaced frequently so that heavy deposits of residue do not accumulate. Provide details on the access panels or other means within plans that permit easy maintenance of the bags. [NFPA 33 9.4.7.1]
15. Clean agent, CO₂ and dry chemical systems must be capable of discharging its contents into the entire protected area simultaneously, including the exhaust plenum and exhaust ductwork. Provide flow calculations for all nozzles. Any field installation of fixed fire suppression systems must be by licensed sprinkler contractors or fixed fire suppression system contractor. [NFPA 33 9.5 and Rule 0780-2-7 and 0780-2-14]
16. Automated powder application equipment, both listed and unlisted, shall be further protected by listed optical flame detection, installed and supervised in accordance with NFPA 72. The optical flame detection shall, in event of ignition, react to the presence of flame within one-half (0.5) second and shall accomplish all of the following:
 - (1) Stop any conveyors into and out of the spray area. [NFPA 33 9.7.1(1)]
 - (2) Shut off ventilation. [NFPA 33 9.7.1(2)]
 - (3) Shut off application, transfer, and powder collection equipment. [NFPA 33 9.7.1(3)]
 - (4) Close segregation dampers in associated ductwork to interrupt airflows from application equipment to powder collectors. [NFPA 33 9.7.1(4)]
 - (5) Disconnect power to the high voltage elements in the spray area and de-energize the system. [NFPA 33 9.7.1(5)]
17. Automated liquid electrostatic spray application equipment, both listed and unlisted, shall be further protected by listed optical flame detection, installed and supervised in accordance with NFPA 72. The

optical flame detection shall, in event of ignition, react to the presence of flame within one-half (0.5) second and shall accomplish all of the following:

- (1) Meet all of the requirements of 9.2.1. [NFPA 33 9.8.1]
- (2) Disconnect power to the high voltage elements in the spray area and de-energize the system [NFPA 33 9.8.1]

IX. **ELECTRICAL**

- *1. The scope of work has general electrical requirements covered by an occupancy based correction list.
2. For Educational occupancies and Business occupancies exceeding 50/500 occupants (see conditions), provide fire alarm system per SBC 905.1 and NFPA 101 38.3.4 on emergency power. [NFPA 72 1.5.2.5]
3. The fire alarm contractor must be certified in accordance with the Tennessee Alarm Contractors Licensing Act of 1991, TCA Title 62, Chapter 32. Call 615-741-9771 for additional information.)
4. The fire alarm control panel or an annunciating device must be located in an area where trouble signals can be monitored (audibly and visually). [NFPA 72 1.5.4.6 and 1.5.7.1.1] This is to be distinguished from a general alarm system.
5. A fire alarm zone indicator panel must be located at grade level at the normal point of fire department access **or** at a constantly attended building security control center. [SBC 905.1.3]
- *6. See attached Fire Alarm Design Intent correction list for a list of most commonly missed items.
7. Show the following electrical connections:
 - (1) Location of connections of all air handling shutdowns.
 - (2) Location of connections to the kitchen hood fire extinguishing system that activates the fire alarm system. Show other required shutdowns in the event the extinguishing system is activated.
 - (3) Location of all connections to shunt trip circuit breakers and gas solenoid valves - unless a mechanical gas line shut-off is specified.
 - (4) Location of flow switch or alarm check valve connection to the general building alarm and central station or fire department.
 - (5) Location of supervisory alarm connection from tamper switches on sprinkler system.
8. Provide scaled elevations, cuts, plan views and details clearly showing the space where any booth or material storage is located. Include existing light fixtures, fire alarm devices, unit heaters, air intakes, discharge registers, exhaust ducts, unrelated equipment, etc. whether or whether not they exit as a part of this scope of work. This is necessary in both design and review to identify whether or not sources of ignition encroach any and all hazard zones. [Office Policy]
9. For booths with enclosure doors, the type of booth shall be considered "open" when establishing ignition zones unless such a booth is a listed booth with a factory interlocking safety switch mounted at each door and the spray process is electrically interlocked as permitted by NFPA 33 [Office Policy]
10. Electrical wiring and utilization equipment shall meet all of the applicable requirements of Article 500 *Hazardous (CLASSIFIED) Locations Classes I, II, and III, Divisions 1 and 2, 501 Class I Locations, 502 Class II Locations, and 516 Spray Application, Dipping and Coating Processes* of NFPA 70 *National Electric Code*, and NFPA 33 *Spray Application Using Flammable or Combustible Materials*, Chapter 4 unless the exceptions are met. [NFPA 33 6.2.1]

11. For the purposes of NFPA 33, the Zone system of electrical area classification shall be applied as follows:
 - (1) The inside of open or closed containers or vessels shall be considered a Class I, Zone 0 location. [NFPA 33 6.2.2(1)]
 - (2) A Class I, Division 1 location shall be permitted to be alternatively classified as a Class I, Zone 1 location. [NFPA 33 6.2.2(2)]
 - (3) A Class I, Division 2 location shall be permitted to be alternatively classified as a Class I, Zone 2 location. [NFPA 33 6.2.2(3)]
12. Where areas in the same facility are classified separately, a Class I, Zone 2 location shall be permitted to abut, but shall not overlap, a Class I, Division 2 location. A Class I, Zone 0 or Class I, Zone 1 location shall not abut a Class I, Division 1 or a Class I, Division 2 location. [NFPA 33 6.2.4 and NFPA 70 505.7(B)]
13. Devices or equipment (such as unit heaters, fans, open motors or processes) which can produce open flames or sparks, and equipment whose exposed surfaces exceed the auto ignition temperature of the material being sprayed cannot be located in a spray area or in any surrounding area that is classified as Division 2 or Zone 2 with the exception of drying, curing, or fusing apparatus covered by NFPA 33 13. [NFPA 33 6.2.5]
14. Any equipment or apparatus that is capable of producing sparks or particles of hot metal (such as open electrical motors and arc welders) and is located above or adjacent to either the spray area or the surrounding Division 2 or Zone 2 areas shall be of the totally enclosed type or shall be constructed to prevent the escape of sparks or particles of hot metal. [NFPA 33 6.2.6]
15. Electrical wiring and utilization equipment that is located in the spray area and is not subject to deposits of combustible residues shall be suitable for Class I, Division 1; Class I, Zone 1; or Class II, Division 1 locations, whichever is applicable. [NFPA 33 6.4.1]
16. Electrical wiring and utilization equipment that is located in the spray area and is subject to deposits of combustible residues shall be listed for such exposure and shall be suitable for Class I, Division 1; Class I, Zone 1; or Class II, Division 1 locations, whichever is applicable. [NFPA 33 6.4.2]
17. Light fixtures that are attached to the walls or ceilings of a spray area; are separated from the spray area by glass panels that meet the requirements of NFPA 33 5.5; and are located within a Class I, Division 2, Class I, Zone 2, or Class II, Division 2 location shall be suitable for such location. [NFPA 33 6.6.2]
18. Light fixtures that are attached to the walls or ceilings of a spray area; are separated from the spray area by glass panels that meet the requirements of NFPA 33 5.5; Such fixtures shall be serviced from outside the spray area. [NFPA 33 6.6.2]
19. Light fixtures that are an integral part of the walls or ceiling of a spray area shall be permitted to be separated from the spray area by glass panels that are an integral part of the fixture. Such fixtures shall be listed for use in Class I, Division 2; Class I, Zone 2; or Class II, Division 2 locations, whichever is applicable, and also shall be listed for accumulations of deposits of combustible residues. [NFPA 33 6.6.3]
20. Light fixtures that are an integral part of the walls or ceiling of a spray area shall be permitted to be separated from the spray area by glass panels that are an integral part of the fixture. Such fixtures shall be permitted to be serviced from inside the spray area. [NFPA 33 6.6.3]
21. Portable electric light fixtures shall not be used in any spray area while spray application operations are being conducted. [NFPA 33 6.9]

22. Electrical wiring and utilization equipment located outside, but within 20 ft horizontally and 10 ft vertically, of an unenclosed spray area and not separated from the spray area by partitions extending to the boundaries of the area shall be suitable for Class I, Division 2; Class I, Zone 2; or Class II, Division 2 locations, whichever is applicable. [NFPA 33 6.5.1]
23. For closed top open front/face spray booths, any electrical wiring or equipment within 3 feet in any direction outside of the booth around any openings of shall be suitable for Class I, Division 2 locations or Class II Division 2 whichever is applicable. [NFPA 33 6.5.2] Additional requirements exist **for one** of the following:
 - (1) If the exhaust ventilation system is interlocked with the spray application equipment, then the Division 2 or Zone 2 location shall extend 5 ft horizontally and 3 ft vertically from the open face or open front of the booth or room. [NFPA 33 6.5.2(1)]
 - (2) If the exhaust ventilation system is not interlocked with the spray application equipment, then the Division 2 or Zone 2 location shall extend 10 ft and 3 ft vertically from the open face or open front of the booth or room. [NFPA 33 6.5.2(2)]
24. All applicable parts which are in or convey flammable or combustible liquids or aerated combustible solids must be bonded to ground to prevent static buildup per NFPA 33 6.7.

X. STORAGE, HANDLING, AND DISTRIBUTION OF FLAMMABLE AND COMBUSTIBLE LIQUIDS

1. Storage mixing and handling of flammable and combustible liquids shall meet the applicable requirements of NFPA 30 Flammable and Combustible Liquids Code. [NFPA 33 8.1]
2. There shall be not more than three approved flammable liquid storage cabinets in any single process area without the approval of the authority having jurisdiction. [NFPA 33 8.2.1]
3. Storage cabinets shall be listed or shall be designed and constructed to meet the requirements of NFPA 30. [NFPA 33 8.2.1]
4. Any single cabinet shall contain not more than 120 gal of Class I, Class II, or Class IIIA liquids, of which no more than 60 gal be Class I and Class II liquids. [NFPA 33 8.2.1]
5. The amount of liquid permitted in a single spray area shall not exceed 60 gal. [NFPA 33 8.3.3]
6. At least one mixing room must be provided that is either adjacent to or directly connected to each spray area or booth. Dispensing or transfer of liquids from containers, mixing of liquids, and filling of containers, including portable mixing tanks and "pressure pots," shall be done only in a mixing room or in a spray area. [NFPA 33 8.3.1 and office policy]
7. All mixing rooms must meet all of the following [NFPA 33 8.3.2]:
 - (1) The mixing room shall meet the construction requirements of NFPA 33 5.1.
 - (2) The total area of the mixing room cannot exceed 150 square feet.
 - (3) The mixing room must be designed to contain a spill.
 - (4) The mixing room or a spray area used for mixing and dispensing operations shall be provided with continuous mechanical ventilation capable of providing not less than 0.3 m³ per minute of air movement per m² of floor area 1 ft³/min/ft² or 150 ft³/min, whichever is greater. The ventilation system shall be in operation at all times.
 - (5) Dispensing and mixing rooms shall be classified, for purposes of electrical area classification, the same as enclosed spray booths, in accordance with NFPA 33 6.5.4.
 - (6) The mixing room shall be provided with an approved automatic fire protection system that meets all applicable requirements of NFPA 33 Chapter 9.

- (7) The mixing room shall be provided with portable fire extinguishers located in accordance with NFPA 10.
8. Where a separate mixing room is provided and the mixing room is located adjacent to or within 6 ft of an adjacent spray area/areas the combined quantities of liquids located in the spray areas and the mixing room cannot be more than 120 gal. [NFPA 33 8.3.4]
9. Where a separate mixing room is provided and the mixing room is located 6 ft or more from an adjacent spray area or areas, the quantity of liquid permitted in the mixing room shall not exceed 2 gal/ft², up to a maximum of 300 gal. [NFPA 33 8.3.5]
10. Piping for flammable or combustible liquids that carry material between tanks and mixing rooms must be steel or other materials mechanically and thermally capable of withstanding heat and physical damage. Piping must also be bonded to ground. [NFPA 33 8.4.1]
11. Piping for spray areas must be steel or other materials mechanically and thermally capable of withstanding heat and physical damage. Where tubing or hoses are used, a mechanical shut-off valve must be provided. [NFPA 33 8.4.2]
12. Where pumps are provided, all hoses, piping, fittings must be rated for the maximum discharge of the pump. [NFPA 33 8.4.4]
13. Where pumps are provided, automatic shut-offs must be provided in the event of fire. When the tanks are greater than 5 gallons, automatic shut-offs must be provided at the tank outlet in the event of fire. [NFPA 33 8.4.5]
14. All tubing, hoses, couplings, fittings, shall be inspected for cracks, leaks etc. at regular intervals and replaced at manufacturers' recommended intervals and replaced as necessary. [NFPA 33 8.4.3 & 8.4.6]
15. Pressurized containers used to supply spray nozzles, air storage tanks, and coolers shall meet the requirements of ASME *Boiler and Pressure Code*, Section VIII for construction, maintenance, and tests unless all exceptions are met. [NFPA 33 8.5.5]

XI. STYRENE CROSS-LINKED COMPOSITES MANUFACTURING (GLASS FIBER REINFORCED PLASTICS) (fiberglass spray operations).

1. Resin application areas shall be protected by an automatic sprinkler system in accordance with NFPA 13 and designed for at least Ordinary Hazard, Group II. [NFPA 33 17.3]
2. The quantity of flammable and combustible liquids located in the vicinity of the resin application area of an inside storage room or storage cabinet in any one process area shall not exceed the greater of any of the following [NFPA 33 17.4]:
- (1) A supply for one day. [NFPA 33 17.4(1)]
 - (2) The sum of 25 gallons of Class IA liquids in containers and 120 gallons of Class IB, IC, II or III liquid in containers. [NFPA 33 17.4(2)]
 - (3) One approved portable tank not exceeding 660 gallons of Class IB, IC, II or III liquids. [NFPA 33 17.4(3)]
3. Electrical wiring and utilization equipment located in resin application areas that is not subject to deposits of combustible residues shall be installed in accordance with the requirements of the National Electric Code for ordinary hazard locations. [NFPA 33 17.5.1]
4. Electrical wiring and utilization equipment located in resin application areas that is subject to deposits of residues must be listed for exposure and will be suitable for Class I, Division 1; Class I, Zone 1; or Class II, Division 1 locations, whichever is applicable. Such wiring and utilization equipment must be installed

in accordance with the requirements of NFPA 70 for the hazardous (classified) location involved. [NFPA 33.5.2]

5. All metal parts of resin application areas, exhaust ducts, ventilation fans, spray application equipment, work pieces or containers that receive the spray stream, and piping that conveys flammable or combustible liquids shall be electrically grounded. [NFPA 33 17.5.3]
6. Mechanical ventilation shall be designed and installed throughout the resin application area in accordance with NFPA 33, Chapter 7 unless they are not enclosed for at least 3/4ths of their building perimeter. [NFPA 33 17.5.3]
7. Excess catalyzed resin, while still in the liquid state, shall be drained into an open-top, noncombustible container. Enough water shall be added to the container to cover the contained resin by at least 2 in. of water. [NFPA 33 17.7.2]
8. In areas where chopper guns are used, paper, polyethylene film, or similar material shall be provided to cover the exposed surfaces of the walls and floor to allow the build-up of overchop to be removed. When the accumulated overchop has reached an average thickness of 2 in., it shall be disposed of after a minimum curing time of 4 hours with the exception of a single day's accumulation of more than an average of 2 in. shall be permitted, provided that it is properly cured and disposed of before operations are resumed. [NFPA 33 17.7.2]

XII. DRYING, CURING OR FUSION PROCESSES

1. Drying, curing, or fusing apparatus used in connection with spray application of flammable and combustible materials shall meet all applicable requirements of NFPA 86. [NFPA 33 13.1.1]
2. Spray booths, spray rooms, or other enclosures used for spray application of flammable and combustible materials shall not be used for drying, curing, or fusing operations with the exception of those permitted by NFPA 33 13.2 (air dry) and NFPA 33 13.3 (specially designed heated). [NFPA 33 13.1.2]
3. If a spray booth, spray room, or other enclosure is also used for air-drying, curing, or fusing operations and the air temperature therein is not elevated above ambient conditions, the ventilation system shall maintain the concentration of any vapors in the exhaust stream below 25 percent of the lower flammable limit. Provide calculations for the worst case material sprayed in the booth. [NFPA 33 13.2]
4. Spray booths, spray rooms, or other enclosures used for spray application operations shall be permitted to be adjacent to or connected to rooms or equipment used for drying, curing, or fusing. Interconnecting doors and related interlocks shall meet the requirements of NFPA 86. Provide a copy of the listing card directly in prints. [NFPA 33 13.3.2 and office policy]
5. Interconnecting doors' interlocks must be provided to prevent spray application operations when the doors are open. A high temperature limit switch shall be provided to automatically shut off the drying apparatus if the air temperature in the spray area exceeds 200°F. Provide documentation on plans. [NFPA 33 13.3.2]
6. A high temperature limit switch must be provided to automatically shut off the drying booth if the air temperature in the spray area exceeds 200°F. [NFPA 33 13.3.1.2]
7. Spraying apparatus, drying apparatus, and the ventilating system shall be equipped with interlocks arranged so that the spraying apparatus cannot be operated when drying apparatus is in operation or is energized. Provide clear details exactly how the spraying system is functionally locked out of operation. [NFPA 33 13.3.1.3]

8. Radiant drying apparatus that is permanently attached to the walls, ceiling, or partitions of the spray area shall be listed for exposure to flammable or combustible vapors, mists, dusts, residues, or deposits. [NFPA 33 13.3.1.4]
9. Drying, curing, or fusing apparatus shall be affixed with a permanently attached, prominently located warning sign indicating that ventilation shall be maintained during the drying, curing, or fusing period and that spraying shall not be conducted in the vicinity in such manner as to deposit residue on the apparatus. NFPA 33 13.6]